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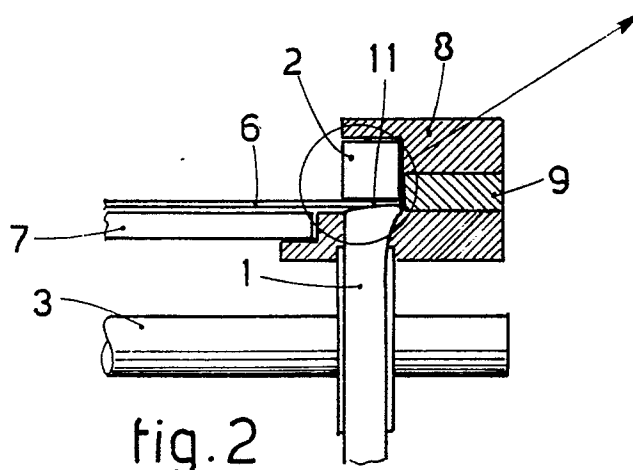
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Device to draw a strip of flexible material.

Device to draw a strip (6) of flexible material, which is advantageously but not only of a photographic film, in which device there may be included a slide surface (7) on which the strip (6) moves forward, and there may also be included reference and guide means (9) against which the strip (6) abuts with at least one of its edges (11), the device providing at least one motive roll (1) and a counter-roll (2) which are able to cooperate with at least that one edge (11) to perform the drawing action, the circumferential periphery of the motive roll (1) comprising profile means (12-13) able to exert on the edge (11) of the strip (6) at least a first action (16) directed substantially in a direction perpendicular to a second action (17) which is directed in the direction of forward movement of the strip (6), the first action (16) being suitable to exert a lateral thrust on the edge (11) against the reference and guide

means (9) and being substantially less strong than the second action (17) so as to ensure a constant straight forward movement of the strip (6).



DEVICE TO DRAW A STRIP OF FLEXIBLE MATERIAL

This invention concerns a device to draw a strip of flexible material and, in particular, a photographic film.

This device can be employed to draw a film to be developed in developer baths or to feed films in machines for packaging strips of negatives in envelopes automatically or in photographic printing machines.

The device according to the invention serves more generally to feed photographic films, whether developed or not.

According to a variant of its application the invention serves also to feed strips of any flexible material.

For the sake of simplicity of description we shall refer hereinafter to the use of the invention with regard to films.

A motive roll and a driven counter-roll of this device are able to act on at least one edge of the strip so as to cooperate together in drawing it.

Many devices of this kind are known which belong, for instance, to so-called sleever machines, namely machines able to cut and package strips of negatives of film automatically in envelopes.

One of the most complex problems to be overcome in these machines, as in developing machines which serve to develop exposed films, is the conveying and forward movement of the negative.

First of all it is necessary to ensure the good condition of the film without, for instance, beating it with rolls, so as to prevent the emulsion being ruined.

A roll is therefore employed which is generally made of a soft deformable rubber and cooperates with a counter-roll, which may be metallic.

Both the roll and counter-roll, one of which acts on one face of the film while the other acts on the other face, can work on a small tract along one edge of the film so as to cause its forward movement.

For this movement to be straight, in sleever machines the slide surface on which the film runs is equipped with a reference surface against which the film abuts, while on the opposite side there are some holes in which pins have to be inserted and be positioned one after another in rows arranged parallel to the direction of forward movement of the film, the film abutting against the pins.

It is obvious that, each time a film of a different format is processed, it is necessary to change the position of the pins on the slide surface.

The same problem concerning the sliding and guiding of photographic films exists also in developing machines, where the film runs on a substan-

tially vertical plane but its edges run within two recesses machined in the sides of the two walls, which therefore form a slide path.

In this case too the advance of the film is ensured by a roll and counter-roll that act only on one edge of the film.

Without any special arrangements the roll and counter-roll are intended to make the film slide not only in the direction of its advance but also in a direction inclined in relation to its advance.

In the case of developing machines this action can lead to the film being deformed and leaving the recesses machined in the lateral walls.

A problem which the device according to the invention has the purpose of overcoming is to ensure that the action of the roll and counter-roll on the film is mainly directed in the direction of advance of the film during the drawing phase.

The action of the roll and counter-roll should also obtain on the film a controlled transverse component of the action of forward movement. This transverse component has the effect that the film is kept constantly in a lateral position coordinated with the slide guides or with the reference surface.

On the one hand this prevents the film leaving the reference guides and also obviates the need for pins which have to be arranged differently each time to suit the format of the film.

These problems are overcome by the device according to the main claim. The dependent claims contain variants of the idea of the main embodiment.

These and other features will be shown in the following description and attached figures, which are given as a non-restrictive example and in which:-

Fig.1 shows a three-dimensional, simplified, diagrammatic view of the device according to the invention;

Fig.2 shows a section along the plane according to the line A-A of Fig.1;

Fig.3 shows a cutaway view of a part of Fig.2;

Fig.4 gives a vectorial diagram of actions;

Fig.5 shows a plan view of a developing machine;

Fig.6 gives a front view of the same detail as the preceding figure;

Fig.7 gives a plan view of a detail of a machine that processes films having a format greater than 35 mm.;

Fig.8 gives a vectorial diagram of actions.

A device according to the invention comprises at least one motive roll 1, which has at least its

circumferential part made of a soft, deformable rubber (Figs.1, 2 and 3), and at least one corresponding driven counter-roll 2 made of metal or another material possessing a given hardness.

The roll 1 is able to rotate about a shaft 3, while the driven counter-roll 2 is able to rotate about an axis 4 (Fig.3).

A film 6 is able to advance on a slide surface 7 (Fig.2) in a direction perpendicular to the plane of the figure.

In this example the driven counter-roll 2 is lodged in a seat machined in a cover 8 and in a reference and guide block 9, which forms a reference means against which one edge 11 of the film 6 abuts.

Fig.3 shows with lines of dashes the circumferential outline of the roll 1 along the whole outer circular development of the roll except in the zones where the roll 1 comes in contact with the counter-roll 2.

The outline of the roll 1 marked with lines of dashes consists of an apex 12 and a bevel 13. The bevel 13 may be substantially straight or may contain a rounded or convex surface suited to the particular effects to be achieved.

When the roll 1 comes in contact with the counter-roll 2, the apex 12 is deformed and lowered and takes on a new outline 14.

In taking up this new outline 14 the circumferential profile of the roll 1 exerts a resilient action due to two components on the film 6, or more precisely on the edge 11 of the film.

A first action 16 (Fig.4) is directed in a direction perpendicular to a second action 17, which is directed in the direction of advance of the film 6.

In actual fact it is the apex 12 which exerts the first action 16 substantially, whereas the displacement of the bevel 13 exerts the second action 17 on the film 6.

The first action 16 is the one which ensures abutting of the edge 11 of the film 6 against the reference block 9 and also ensures the advance of the film 6 in the direction of the second action 17.

This prevents the film undergoing transverse actions which would modify the path of its straight advance on the slide surface 7. It is clear that it is the profile itself of the roll 1 which determines the value of the first and second actions 16-17.

In fact, the greater the prominence of the apex 12, the greater its deformation when it comes in contact with the counter-roll 2 and therefore the greater the value of the first transverse action 16.

The bevel 13 of the roll 1 with its geometric characteristics is responsible for the second action 17 of Fig.4.

The profile of the roll 1 has a development such that the second action 17 is substantially preponderant as compared to the value of the first

action 16. As a principle it can be admitted that the first action 16 has a value substantially between one-half and one-sixth of that of the second action 17. This is enough to keep the edge of the film 6 adhering to the reference block 19 constantly.

In a machine to develop negatives a roll 1 made of a resilient, deformable material (Fig.5) is able to cooperate with a counter-roll 2 in advancing a film 6 with a constantly straight progress owing to the profile of the roll 1, which is provided with an apex 12 and a bevel 13 in a manner analogous to that described for the sleeve machine.

The apex of the roller 1 is deformed on coming in contact with the counter-roll 2 and takes on an outward profile 15.

The roll 1 and counter-roll 2 act on one edge 11 of the film 6 and make the film advance between two guides 9 (Fig.6) machined in two walls 10 to ensure a straight advance of the film 6.

The action exerted by the roll 1 is such as to cause the film 6 to abut against the righthand guide 9 without deforming the film, thus obviating the danger that the film may leave the two guides 9.

With films having a format up to 35 mm. the film drawing devices for sleeve machines or developing machines may comprise one single pair of a roll 1 and counter-roll 2, as in Fig.1, able to act on only one edge 11 of the film 6.

More complex problems arise when the film has a format greater than 35 mm., for instance 120 mm.

In this case it is necessary to act on both edges of the film with a double, divergent action which, by flattening the film transversely, causes it to be retained at both sides.

This matter concerns not only the sleeve machines, in which the film runs on a surface, but also the developing machines, in which the film runs in two guides, as we have already seen in Figs.1 and 6 respectively.

It is therefore advantageous with films having a format greater than 35 mm. to provide two pairs of rolls 1 and counter-rolls 2.

In this case a first pair consisting of a roll 1 (Fig.7) and counter-rolls 2 will be provided which acts on the righthand edge 11 of the film 6, and a second pair consisting of a roll 1 and counter-roll 2 will be provided which acts on the lefthand edge 111 of the same film.

The action exerted on the film by the two pairs of rolls 1 and counter-roll 2 is shown in Fig.8. It comprises a first vector 17 and second vector 117, which are directed in the direction of advance of the film 6, and also two actions 16 and 116 directed in a perpendicular direction towards the right and left respectively.

The first vector 17 is added to the action of the second vector 117 in the direction of advance of

the film 6, while the action 116, being directed in a direction opposite to the action 16, acts on the lefthand edge 111 of the film 6 (Fig.7) and is directed towards the left.

In actual fact the two actions 16-116 (Fig.8) cancel each other but they serve to keep the film 6 under tension during its advance and obviate the need for further complicated devices to prevent deformation and bending of the film when advancing.

It is clear that the actions 16-116 are due to the inclusion of the apices 12 and bevels 13 on the relative rolls 1 of Fig.7.

The geometric conformation of the apex 12 and bevel 13 may be the same on both rolls 1 or be differentiated as required.

It is evident that the apex 12 of the rolls 1 will be located on the outside of each single roll 1, so that on the righthand roll 1 the apex 12 will lie substantially wholly on the right, whereas on the lefthand roll 1 the apex 12 will lie substantially wholly on the left. This will enable the actions 16 and 116 to be obtained with opposite signs.

The same reasoning set forth for the roll 1 and counter-roll 2 of Fig.2 will also apply to these pairs of rolls 1 and counter-rolls 2.

Claims

1 - Device to draw a strip (6) of flexible material, which is advantageously but not only of a photographic film, in which device there may be included a slide surface (7) on which the strip (6) moves forward, and there may also be included reference and guide means (9) against which the strip (6) abuts with at least one of its edges (11), the device providing at least one motive roll (1) and a counter-roll (2) which are able to cooperate with at least that one edge (11) to perform the drawing action, the device being characterized in that the circumferential periphery of the motive roll (1) comprises profiled means (12-13) able to exert on the edge (11) of the strip (6) at least first action (16) directed substantially in a direction perpendicular to a second action (17) which is directed in the direction of forward movement of the strip (6), the first action (16) being suitable to exert a lateral thrust on the edge (11) against the reference and guide means (9) and being substantially less strong than the second action (17) so as to ensure a constant straight forward movement of the strip (6).

2 - Device as claimed in Claim 1, in which the first action (16) is substantially between one-half and one-sixth of the value of the second action (17).

3 - Device as claimed in Claim 1 or 2, in which the profiled means (12-13) of the motive roll (1) consist of an apex (12) and a bevel (13), which are capable of being deformed resiliently when they become engaged by the counter-roll (2), the apex (12) when thus deformed being able to exert on the edge (11) the first lateral action (16) substantially perpendicular to the forward movement of the strip (6), the bevel (13) being able to exert on the strip (6) the action of forward movement (17).

4 - Device as claimed in any claim hereinbefore, which is able to process films having a format greater than 35 mm. and is characterized by two pairs of rolls (1) and counter-rolls (2), each pair of the rolls and counter-rolls (1-2) developing an action (17-117) in the same direction in the direction of forward movement of the strip of film (6) and two actions (16-116) of an opposed sign towards the outside of the respective edges (11) of the film, the two outward actions (16-116) of an opposed sign keeping the strip (6) under transverse tension.

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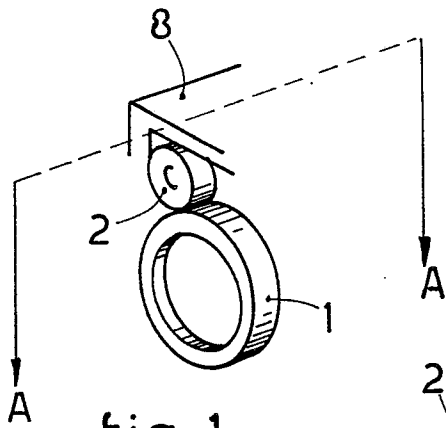


fig.1

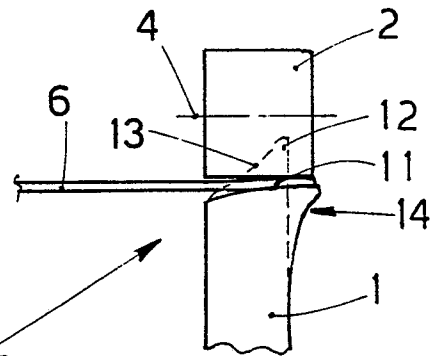


fig.3

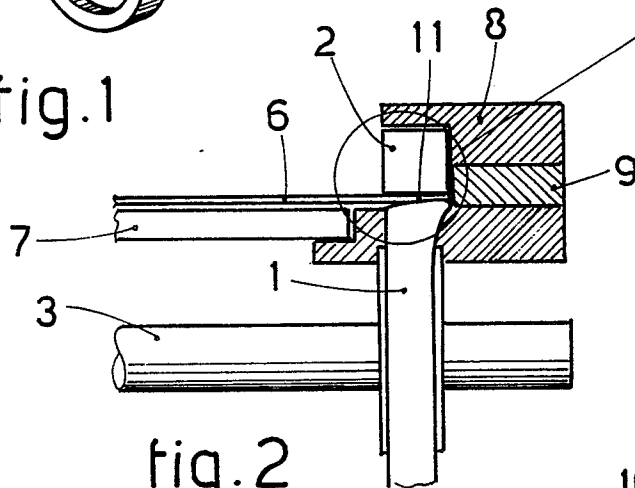


fig.2

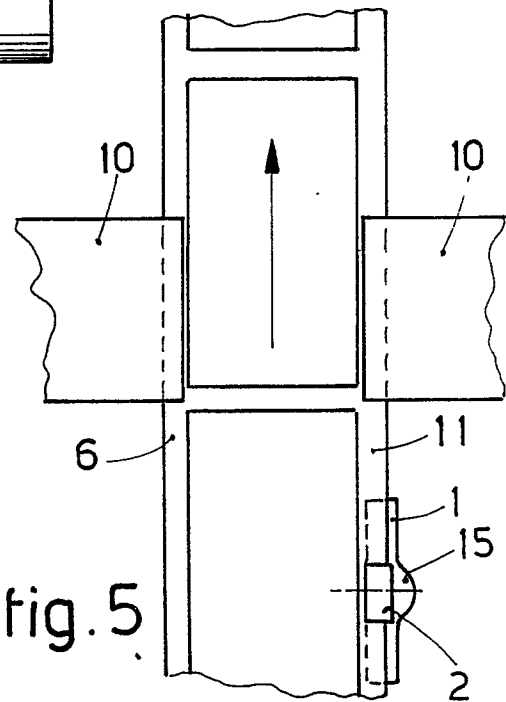


fig.5

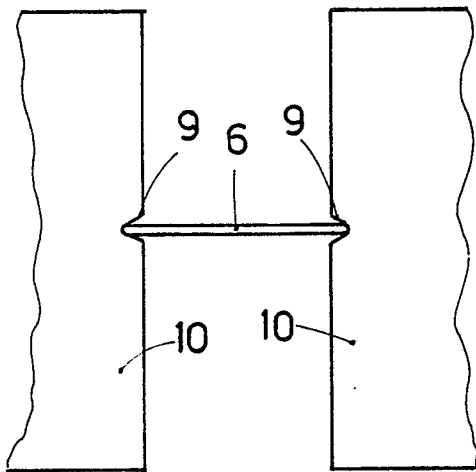


fig.6

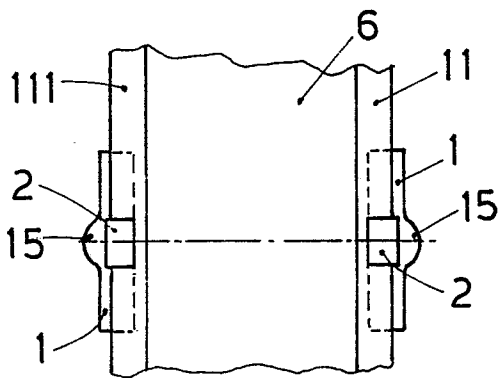


fig.7

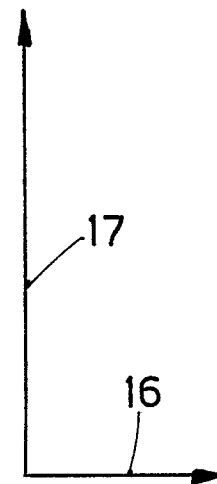


fig.4

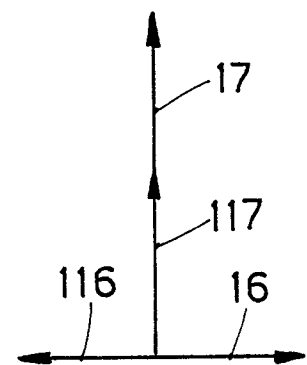


fig.8

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